

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter analyzes the potential environmental consequences that would result from implementation of the Proposed Action and the No-Action Alternative. The analysis of environmental consequences for each resource potentially affected by exploration and interim development in the 3,692-acre BCII PA are addressed in this chapter, which also addresses cumulative impacts that may result from past, present, and reasonably foreseeable future activities within the BCII PA.

An environmental consequence, or impact, is defined as a change or modification in the existing environmental conditions resulting from implementation of the Proposed Action. Impacts can result directly from the Proposed Action, or can be a secondary or indirect result of the Proposed Action. Additionally, impacts can vary in the duration they affect the environment; they can be permanent or long lasting (long-term) or temporary (short-term).

Short-term impacts normally occur during the construction and start-up phases of the project. These impacts usually last two years or less and can be mitigated successfully if proper management is applied. Long-term impacts are changes to the affected environment occurring during construction or operation of the project that last longer than two years and potentially for the life of the project or beyond.

Construction of the proposed BCII facilities would occur within the existing Brown Cow/Browning Field development. The Browning Field is a historic oil field comprised of 14 producing oil wells and associated infrastructure (i.e. access roads, flowlines, produced water lines, water injection wells, and compressor station). The Brown Cow I project was constructed in 2005 and consisted of 12 coalbed methane wells encompassing a total of 12.6 acres. In addition to the well pads established during these operations, associated access roads (5.8 acres), gas gathering and water disposal pipelines (18.8 acres), injection wells (1.0 acre), and a pumping station (0.7 acre) were constructed. Also, a total of 4,023 feet of existing roadway were upgraded in conjunction with the Brown Cow I construction.

4.2 GEOLOGY, MINERALS, AND PALEONTOLOGY

4.2.1 Alternative 1 – Proposed Action

Construction of the proposed wells and associated facilities would result in the disturbance of soils and vegetation that could increase the probability of altering slopes and other topographical features in the BCII PA. If surface features are altered, this could increase the potential for erosion and mass movement of earth materials. Approximately 78.1 acres of short-term impacts and 20.8 acres of long-term impacts would occur by surface-disturbing activities in the BCII PA.

Mass movement of earth materials is the greatest geologic hazard threat in the BCII PA. The surface geologic formations within the BCII PA, the Lewis and Lance Formations, contain shale beds that are prone to mass movement. They are most susceptible to movement along the western side of their exposure where removal or erosion has weakened the formation. Disturbance of these sites could result in landslides, slumping, creep, and earth flowage. Avoidance of shale formations would limit the possibility of this geologic hazard and impacts to

geology and geologic hazards would be reduced by implementing the mitigation measures described in Chapter 2.

Mineral development in the BCII PA has been limited to natural gas and oil. No other economically important mineral resources have been located within the BCII PA. Full field development and the resulting production of CBNG in the BCII PA could result in depletion of these reserves.

Construction of well pads, access roads, and the excavation of pipeline and utility line trenches could result in the exposure and potential damage of fossil resources. However, there is a possibility of new fossil resources being discovered, properly recovered, and transferred to a museum repository where they would be available for study.

There is no record of fossil locations in the BCII PA. However, Lewis shale, which has been documented to contain large amounts of fossil material in other areas, is widely distributed in the BCII PA, and represents a potential source of fossils. Potential impacts to paleontological resources would be diminished by implementing the mitigation measures described in Chapter 2.

4.2.2 No-Action Alternative

Under the No-Action Alternative, ongoing natural gas production activities would be allowed to continue; however, no exploratory wells would be authorized in the BCII PA. Therefore, no impacts to geology, minerals, and paleontological resources are expected.

4.3 AIR QUALITY

4.3.1 Alternative 1 – Proposed Action

Small air quality impacts would result from pollutants emitted during construction, including fugitive dust generated from earth moving equipment and vehicles, well drilling and completion, and engine exhaust; as well as from production activities, including emissions from natural gas wells, engine exhaust, and fugitive dust. Pollutants emitted during these activities would include NO_x, CO, SO₂, PM₁₀, PM_{2.5}, volatile organic compounds, and HAPs (e.g. benzene, toluene, ethylbenzene, xylene, n-hexane, and formaldehyde).

Temporary effects to air quality in the immediate vicinity of the BCII PA would occur from construction activities. However, based on the small number of exploratory wells present in the BCII PA, emissions would be low. These pollutants would be comprised of particulate matter and exhaust originating from vehicles and earth moving equipment. Construction emissions would be temporary, lasting only for the duration of construction activities.

Production emissions would occur for the life of the project. The amount of air pollutant emissions is controlled by the best available control technology regulations implemented by the WDEQ-AQD. Air pollutant emissions have been recently analyzed by the BLM for the ARPA during preparation of the Atlantic Rim EIS. This air quality analysis conducted detailed modeling for 2,000 proposed wells being planned in the ARPA. The modeling was conducted for both near-field and far-field impacts and modeling results indicated near-field air emission impacts would be less than NAAQS and WAAQS (BLM 2005). Far-field concentrations would be below all applicable NAAQS, WAAQS, CAAQS, and PSD increments. Direct visibility

impacts would be below the 1.0 dv (“just noticeable visibility change”) for all sensitive Wilderness Areas. Additionally, the maximum sulfur and nitrogen deposition potential resulting from ARPA production sources are below the 0.005 kg/ha-yr DAT for all of the sensitive PSD Class I and II areas analyzed in the Atlantic Rim EIS. All of the acid sensitive lakes analyzed in the EIS showed the ANC change would be less than the LAC from project area emission sources.

The emissions associated with the proposed project would be similar to other natural gas projects in Wyoming but, due to the small size of the project (only 12 production wells and one compressor station), emissions would be on a much smaller scale. Based on the low emissions, no ambient air quality standards would be violated and no substantial impacts to air quality would occur as a result of the proposed project. However, BCII PA emissions would contribute to regional emissions that reduce far-field visibility in Class I and II areas. This contribution would be negligible when compared with large regional emission sources.

4.3.2 No-Action Alternative

Under the No-Action Alternative, no new gas wells would be installed in the BCII PA. Therefore, no new emission sources would occur in the BCII PA.

4.4 SOILS

4.4.1 Impact Significance Criteria

The following criteria serve as a basis to assess the intensity, duration, and magnitude of potential soil impacts associated with implementation of the Proposed Action and Alternatives. Soil impacts would be significant given the following:

- Soil erosion is increased beyond two tons per year within five years of disturbance;
- Interim reclamation is not successful within three years of implementation;
- Water resources significance criteria are not met;
- Vegetation significance criteria are not met; or
- Soil productivity is reduced to a level that prevents the disturbed area from recovering to pre-disturbance soil/vegetation productivity levels.

4.4.2 Alternative 1 – Proposed Action

The proposed construction and operation of wells and facilities could affect the productivity of soils in the BCII PA by:

- Removing existing native vegetation cover;
- Redistributing or removing all or part of the topsoil profile, especially mixing this profile with higher salinity subsoils;
- Compaction of soils;
- Decreasing topsoil productivity;

- Exposing soil to accelerated wind and water erosion;
- Potentially covering adjacent soils and drainages with sediments;
- Exposing soil to noxious and invasive weed infestation; and
- Potential damage to sensitive biological soil crusts.

Proposed project activities would reduce soil productivity within and immediately adjacent to the areas of disturbance. The effects of these activities on soil productivity have been evaluated based on their duration, magnitude, and intensity. Both long-term and short-term effects on soil productivity would occur under the Proposed Action. Approximately 78.1 acres of soil would be affected in the short-term (two years or less) and 20.8 acres of soil would be affected in the long-term (greater than two years).

Vegetation and soil would be removed from areas where proposed well pads, compressor pads, discharge facilities, roads, and other facilities would be constructed. This soil and vegetation removal may result in erosion, as most of the soils present in the BCII PA exhibit the potential for moderate to severe erosion.

As a result of proposed construction activities, the productivity of soils could decline due to:

- Reduced soil microbial activity and soil fertility;
- Interruption of soil nutrient and organic matter from vegetation;
- Impaired water infiltration from soil compaction;
- Mixing of soil horizons and soils of differing chemistry/composition;
- Damage to sensitive biological crusts; and
- Topsoil loss.

The intensity of these effects would vary according to the type and location of disturbance, development and production activities, use of mitigation measures, and the length of disturbance prior to reclamation. To address these soil productivity issues, the Proponents have committed to implementing the mitigation measures described in Chapter 2. Efforts will be made to ensure compliance with these mitigation measures in an accurate and timely manner.

Following drilling, testing activities, and construction of the proposed facilities, the disturbed areas not required for production of natural gas would be reclaimed to BLM standards. Facility areas and roads would be regraded to blend the disturbed area into the surrounding topography. Regraded areas and redistributed soil would be scarified to alleviate compaction and seeded to reduce wind and water erosion. Measures to control erosion, runoff, and sedimentation during operations and reclamation are described in Chapter 2.

Biological soil crusts are very sensitive and easily damaged by off-road vehicle use. The use of project-related vehicles off of designated roads would be prohibited to prevent damage to biological soil crusts. This measure should ensure that negligible damage would occur to biological soil crusts potentially present in the BCII PA.

Overall impacts to soil resources in the BCII PA are anticipated to be low based on the following evaluation:

- Small area of proportional disturbance;
- Use of proper construction and reclamation techniques; and
- Implementation of the mitigation measures described in Chapter 2.

4.4.3 No-Action Alternative

Under the No-Action Alternative, none of the proposed activities would occur. Therefore, no new disturbance of soils from oil and gas exploration would occur.

4.5 WATER RESOURCES

4.5.1 Alternative 1 – Proposed Action

No effects on groundwater or surface water would be anticipated as a result of the proposed project with the use of proper construction techniques, drilling practices, proper operating procedures, and implementation of the mitigation measures described in Chapter 2.

Groundwater would be removed from the coal seam aquifers within the Mesaverde Group, which range in depth from 2,025 feet to 3,325 feet. Groundwater within the BCII PA is generally suitable for livestock use; however, it was deemed unsuitable for drinking due to elevated levels of iron, manganese, and TDS. Groundwater within the BCII PA is also unsuitable for agricultural use because of excess residual sodium carbonate.

The targeted coal seams are classified as confined to semi-confined aquifers because they are bounded by confining layers that consist of impervious to semi-pervious layers of shale and siltstone. Hydraulic connection between the coal seams and any aquifer stratigraphically above or below the coal seams is limited. Confined, or artesian, aquifer conditions of this type indicate an effective seal above and below the aquifer. However, lowering the hydraulic head in the coal seam aquifers by removing water may induce a slight leakage through the semi-pervious shale layers into the pumped aquifer. Because of the extremely low hydraulic conductivity of the confining layers and the limited number of new gas wells proposed (12), enhanced leakage from an aquifer stratigraphically above or below the affected coal seams would be small.

The proposed exploratory wells would produce water that would be disposed of in five deep injection wells. The depth of the injection wells, which would be completed in the Haystack Mountain Formation, is expected to be between 3,000 feet and 5,000 feet. The produced water that would be injected into these wells is of higher quality than the groundwater in these formations; therefore, the only effect on the injection horizons would consist of an increase in the hydraulic head emanating from the injection well, which would dissipate with distance from the wellbore. In terms of water quantity and quality, the effect of the Proposed Action on the injection horizon would be low.

Because water produced would be injected, no surface waters of the State would be affected by the management of produced water. All injection wells would be permitted with the state agency that regulates the facilities, including but not limited to the WOGCC or WDEQ.

Produced water would be collected in a buried HDPE flowline (pipeline) for transport to an injection well. To keep surface disturbance to a minimum, ditches would combine as many pipelines as possible (e.g. water, electricity, and gas) and BMPs would be used to control erosion and divert overland flows away from the facilities. Centrifugal pumps, reciprocating pumps, filter systems, and tanks at the disposal facility would be used to remove solids from the water stream and to pump the water at pressures sufficient to allow downhole disposal. If it is not possible to safely inject the volume of produced water into the proposed injection wells, some or all of the exploratory wells would be shut-in temporarily while alternative plans are developed and approved. These alternative plans would include additional injection wells. Information about the groundwater system in the BCII PA would be obtained in two ways: first, by monitoring the quality of produced water and second, by monitoring the volume of water produced over time during testing.

The absence of tritium in groundwater is indicative of water that was isolated from the atmosphere prior to the early 1950s when large amounts of tritium were introduced into the environment through testing of nuclear devices in the atmosphere (Faure 1986). The tritium content of the eight samples indicates pre-1950s recharge. Furthermore, the isotopic ratios of ^{18}O and deuterium indicate that the groundwater was isolated from the atmosphere when the mean temperature was approximately 10 degrees cooler than present. Since temperatures this low are associated with the Pleistocene Epoch, which ended approximately 10,000 years ago, this information suggests that groundwater flow through the Mesaverde Group coals is sluggish and apparently not closely connected to nearby surface water supplies. **Table 4-1** presents the results of the isotopic analysis.

Table 4-1
Isotopic Analysis of Mesaverde Formation Coal Seam Groundwater

Well	Tritium Content (TU)	$\delta^{18}\text{O}$ SMOW (0/00)	δD SMOW (0/00)
Fed. 1691-16-8	<0.34	-19.32	-145.5
AR Fee 1791 231 Haystack Mountains	<0.50	-19.70	-148.4
AR Fee 1791 231 Deep Creek	<0.60	-19.60	-145.8
AR Fee 1791 231 Cherokee Creek	>0.60	-19.49	-146.7
AR Fee 1791 3-23	<0.50	-18.85	-141.7
AR Federal 1591 91	<0.50	-19.39	-144.4
AR Fee 1890 SE9	<0.50	-19.74	-148.5
AR Federal 1591-7-8 Blue Sky	<0.60	-19.20	-142.9

Notes:

TU= Tritium Unit. One TU is defined as one tritium atom per 1,018 hydrogen atoms.

SMOW= an international standard used for oxygen and hydrogen isotopic analysis.

0/00 is per mil or per thousand.

Potential effects on surface water resources would include increased surface water runoff and off-site sedimentation caused by soil disturbance, impairment to surface water quality, and changes in stream channel morphology caused by construction and road/pipeline crossings.

The effects of construction could produce more sediment, which could potentially end up in drainage channels and alter the flow of the channels. The increased sedimentation would be temporary and would principally occur during construction. Mitigation measures implemented after the construction phase would prevent further sedimentation in drainage channels.

The aspect and gradient of slopes in the project area could alter the flow of surface water. Steep slopes would increase the surface water velocity, which would accelerate the erosional process and would allow for the sediment to be deposited, further altering the flow.

The top layer of soil is generally the most nutrient rich horizon and most important to the success of vegetation. Complete removal of this horizon would impede the germination and establishment of vegetation.

Construction of wells in poor quality soil would likely increase the potential for water resource contamination. Compaction of a poorly drained soil would further limit the ability of the soil to drain, which would increase surface run-off, potentially increasing sedimentation in local water resources.

Timely implementation is essential to the success of mitigation measures. Soils exposed for long periods of time are likely to erode with potential for loss of valuable topsoil and contamination of local water resources. Initiating mitigation measures immediately after construction is completed would increase the chances for successful seeding and soil stabilization. The re-establishment of root systems and ground cover would greatly decrease the potential for wind or water erosion.

Increases in sedimentation that would occur as a result of the proposed project would be small, because construction and operation would comply with the mitigation measures described in Chapter 2. Potential impacts from construction would likely be greatest in the short-term and would decrease in time as a result of stabilization, reclamation, and revegetation. Construction disturbance would not be uniformly distributed across the BCII PA, but instead would be concentrated near proposed drill locations, access roads, and pipeline/utility ROWs.

4.5.2 No-Action Alternative

Under the No-Action Alternative, the proposed natural gas development would not occur. Therefore, no new impacts to surface or groundwater would occur as a result of natural gas exploration in the BCII PA.

4.6 VEGETATION, WETLANDS, AND INVASIVE WEEDS

4.6.1 Proposed Action

Implementation of the proposed project would result in the loss of native vegetation, especially forb species, in terms of cover and species composition in areas where proposed well sites, facilities, and access roads would be constructed. There is currently no approved forb seed

mixture that could be applied to reclaimed areas and natural recolonization of forb species is very slow to occur. An estimated 78.1 acres would be temporarily affected by surface disturbance associated with drilling and testing activities. Should the exploratory wells be productive, the surface areas required for production facilities would not be reclaimed until production ends, which could be up to 20 years. An estimated 20.8 acres could be permanently affected by production facilities and roads over the long-term.

Mountain big sagebrush and Wyoming big sagebrush would be the primary plant communities disturbed in the BCII PA. These plant communities are commonly found across southwestern Wyoming; therefore, the short-term or long-term loss of these plant community acreages in the BCII PA would not alter the overall project area or regional abundance and quality of these habitats, except for specialized habitat requirements of wildlife species (described in **Section 4.8**). The total acreage of long-term vegetation impacts within the BCII PA are found in **Table 4-2**.

Table 4-2
Long-Term Vegetation Impacts

Vegetation Community	Impacted Acres
Mountain big sagebrush	13.5
Wyoming big sagebrush	4.8
Alkali sagebrush	1.8
Juniper woodlands	0.7
Total	20.8

In general, the duration and effects on vegetation in the BCII PA would depend on the time required for natural succession to return disturbed areas to pre-disturbance conditions of diversity (both species and structural). In addition, the success of mitigation (seeding) would be influenced by climatic and soil conditions.

Surface disturbance could affect vegetation directly and indirectly by removal of existing vegetation and by allowing establishment of noxious and invasive weeds. Weedy species often thrive on disturbed sites such as road ROWs and out-compete more desirable plant species. This would result in reduced species diversity, reduced vegetative structure, and potentially reduced ground cover. The BCII PA is known to be vulnerable to invasion of noxious and invasive weed species and the potential for weeds to occur would increase with construction activities occurring in the BCII PA. Utilizing proper BLM approved reseeding mixtures would help mitigate the potential for invasive weed infestation on disturbed sites. Additionally, monitoring of disturbed sites would be required to identify any noxious weed invasion.

Development of the proposed project is not expected to directly affect Federally-listed plant species. None of the seven BLM sensitive plant species discussed in Chapter 3 have known occurrences in the BCII PA (WYNDD 2005). No threatened or endangered plant species are expected to occur in the BCII PA because of a lack of suitable habitat. Due to the small amount

of disturbance and lack of suitable habitat associated with the Proposed Action, no impacts to sensitive plant species are expected to occur.

A total of 4.2 acres of wetlands are mapped within the BCII PA. A total of 0.13 acre of wetlands is located is mapped at the proposed AR Federal Well 1491 1-11 site. The proposed well will be located on a previously disturbed ridge, adjacent to an existing well pad. At the time of the site visit no wetland indicators were observed at the proposed well site. Therefore, no direct impacts to jurisdictional wetlands or riparian areas are expected to occur.

4.6.2 No-Action Alternative

Under the No-Action Alternative, no new natural gas impacts to vegetation or wetlands would occur. Additionally, no new disturbances would occur that could allow invasive weed infestation to occur in the BCII PA.

4.7 RANGE RESOURCES AND OTHER LAND USES

4.7.1 Proposed Action

Anticipated effects on range resources associated with the project are limited to a long-term loss of 20.8 acres of forage and associated AUMs, an increased potential for collisions between livestock and vehicles, an increased potential for dust and subsequent reduced palatability of forage, and an increased potential for the spread of noxious and invasive weed species (previously discussed above under the section on Vegetation, Wetlands, and Noxious Weeds).

Livestock grazing would continue during drilling and interim development and the increased traffic during these phases would correspondingly increase the potential for dust and the potential for collisions between livestock and vehicles. Forage in the BCII PA would be reduced slightly during drilling and field development due to vegetation removal and increased dust, but would be restored as soon as practical and would not constitute a large impact at this level of development. Areas used for roads, production equipment, and ancillary facilities would remain disturbed throughout the productive life of the field.

The average stocking rate for the CGA is eight acres per AUM. The proposed project would result in a short-term loss of forage (78.1 acres) and would temporarily remove 9.8 AUMs from the CGA. The long-term forage loss (20.8 acres) would eliminate approximately 2.6 AUMs from the CGA.

Reclamation may increase forage production and availability in the short-term, since sagebrush would be removed and reseeded with native grass species. This would be beneficial to grazing species such as big game and cattle.

4.7.2 No-Action Alternative

Under the No-Action Alternative, none of the proposed natural gas activities would occur in the BCII PA. Therefore, loss of rangeland and AUMs due to development would not occur. However, beneficial results of the Proposed Action (e.g. increases in native grasses) for rangeland dependent livestock and big game also would not occur.

4.8 WILDLIFE AND FISHERIES

4.8.1 Proposed Action

The proposed development would disturb 78.1 acres of general wildlife habitat during the development phase and would disturb 20.8 acres over the life of the project. Analysis of potential impacts of the Proposed Action on wildlife assumes development of the proposed wells, roads, and ancillary facilities in the approximate locations identified in Chapter 2.

During the production phase, the unused portion of well sites would be reclaimed. Following completion of production operations (the life of the project is estimated at 10-20 years), the well field and ancillary facilities would be reclaimed and abandoned. Well pads would be removed and the areas revegetated with seed mixes approved by the BLM. The duration of impacts to vegetation would depend, in part, on the success of mitigation and reclamation efforts. Additionally, another extremely important factor is the time needed for natural succession to return revegetated areas to pre-disturbance conditions. Grasses and forbs are expected to become established within the first several years following reclamation; however, much more time would be required to achieve reestablishment of shrub communities. For example, mountain big sagebrush returning to pre-existing levels of sagebrush cover following prescribed burns in this area has been documented to take 40-50 years. Consequently, disturbance of shrub communities would result in a long-term loss of these important habitats.

In addition to the direct loss of habitat due to construction of proposed well pads, roads, and pipeline/utility ROWs, disturbances from human activity and traffic would lower wildlife utilization of habitat immediately adjacent to these areas. Species that are sensitive to indirect human disturbance (e.g. noise and visual disturbance) would be impacted the most. Habitat effectiveness of these areas would be lowest during the construction phase when human activities are more extensive and localized. Construction activities within the specified radius of sensitive species would be restricted. Exceptions may be granted by the BLM if they determine the activity has no impact on the species. Disturbance would be reduced during the production phase of operations and some animals may become accustomed to equipment and facilities in the gas field and may once again use habitats adjacent to disturbance areas, while other animals may move to other areas outside the disturbance area.

General Wildlife

The direct project disturbance of wildlife habitat in the BCII PA and outside the project boundaries would reduce habitat availability for a variety of common small mammals, birds, and their predators. The initial phases of surface disturbance would result in some direct mortality to small mammals and the displacement of songbirds from construction sites. In addition, a slight increase in mortality from increased vehicle use of roads in the project area is expected, but quantification of these losses is not possible. The temporary disturbances that occur during the construction period would tend to favor early succession wildlife species such as ground squirrels and horn larks and would have more impact on mid-to-late successional species such as sage sparrows, sage thrashers, and voles. The long-term disturbance would have little effect on wildlife species not dependent upon shrubs. In addition to the direct disturbance acreage, dust would directly and indirectly impact an estimated 15% to 30% more acreage.

Big Game

Impacts to big game wildlife species would include direct loss of habitat and forage, and increased disturbance from drilling, construction, and maintenance operations. Construction activities associated with well pads and roads can reduce the use of surrounding habitat by big game. Although these impacted sites reduce foraging due to the direct loss of native vegetation from ground disturbance, there is an area surrounding these sites that tends not to be utilized due to increased human activity and this “zone” can extend up to 0.5 mile from the developed area. Consequently, development impacts to wildlife can extend further off-site than the actual amount of ground disturbance.

The BCII PA supports pronghorn antelope throughout the year and 78.1 acres of pronghorn winter/yearlong range within the BCII PA would be disturbed under the Proposed Action. 20.8 acres of winter/yearlong range (0.6% of the winter/yearlong habitat in the Baggs Herd Unit within the BCII PA) would be disturbed for the life of the project. No pronghorn crucial winter range would be disturbed under the Proposed Action. Activities associated with the construction phase of the project could temporarily displace pronghorn; however, once construction is complete, some pronghorn would likely habituate and return to pre-disturbance activity patterns, while other animals may move to other areas outside the disturbance area. Reeve (1984) found that pronghorn acclimated to increased traffic volumes and machinery as long as the traffic and machines moved in a predictable manner. In combination, the disturbance of pronghorn seasonal ranges and the potential for pronghorn displacement would reduce the quality of pronghorn habitat surrounding project facilities on the BCII PA.

The BCII PA supports mule deer throughout the year; the northeastern and northwestern portions of the BCII PA (2,070.6 acres) are within winter/yearlong range and the southwestern portion of the BCII PA (1,621.4 acres) is within crucial winter/yearlong range. The proposed wells and developments within the BCII PA would occur in 25.8 acres of mule deer winter/yearlong range and 51.5 acres of crucial winter/yearlong range. Approximately 4.8 acres of mule deer winter/yearlong range (0.2% of the winter/yearlong habitat in the Baggs Herd Unit within the BCII PA) and 16.0 acres of crucial winter/yearlong range (1.0% of the crucial winter/yearlong habitat in the Baggs Herd Unit within the BCII PA) would be disturbed within the BCII PA for the life of the project. Activities associated with the construction phase of the project could temporarily displace mule deer; however, once construction is complete, some of the mule deer would likely habituate and return to pre-disturbance activity patterns, while other animals may move to areas outside the disturbance area. In combination, the disturbance of mule deer seasonal ranges and the potential for mule deer displacement would reduce the quality of mule deer habitat surrounding project facilities on the BCII PA.

Almost the entire BCII PA is classified as elk winter range (3,688.7 acres) with only the extreme northeast corner of the project area classified as winter/yearlong range (3.3 acres). All of the proposed wells and developments within the BCII PA would occur in elk winter range for a total of 77.3 acres of disturbance under the Proposed Action. 20.8 acres of elk winter range (0.6% of the winter range in the Sierra Madre Herd Unit within the BCII PA) would be disturbed within the BCII PA for the life of the project. The potential for elk displacement would reduce the quality of elk habitat surrounding project facilities on the BCII PA. Disturbance of elk while on winter range can increase stress and may influence species distribution (Hayden-Wing 1980, Morgantini and Hudson 1980).

According to management directives in the RMP (USDI-BLM 1990), crucial big game winter ranges will be closed from November 15 to April 30; this closure of areas located in crucial big game winter ranges will reduce disturbance to wintering big game.

Greater Sage-Grouse

Suitable greater sage-grouse habitat is abundant on and around the BCII PA; however, specific measures must be taken to avoid impacting this species. Greater sage-grouse are of special concern because populations throughout the west have been declining; they are listed as a BLM sensitive species, and have been petitioned for listing under the ESA. Under the Proposed Action, 43.7 acres of mountain big sagebrush, the primary vegetation cover type in the BCII PA, would be impacted during construction and 13.5 acres would be impacted in the long-term. Additionally, 15.9 acres of Wyoming big sagebrush would be impacted during construction and 4.8 acres would be impacted in the long-term. Greater sage-grouse may also avoid areas associated with development, including roads and well pads. Greater sage-grouse may also be impacted by noise disturbance associated with human activity, traffic, compressor stations, and drilling operations. Resource specific mitigation measures for greater sage-grouse identified in Chapter 2 would reduce the impacts to leks, nesting areas, and winter habitats. Four active sage-grouse leks have been identified within two miles of the BCII PA (one active lek is located within the BCII PA).

Construction activities within a two-mile radius of occupied leks would be restricted between March 1 and July 15 to provide protection for grouse during the egg-laying, incubation, and brood-rearing period. Throughout the construction period, surface disturbing activities would not be allowed within 0.25 mile of the perimeter of identified active or occupied greater sage-grouse leks. Human activity would be avoided between 6:00 p.m. and 9:00 a.m. from March 1 to May 20 within 0.25 mile of the perimeter of occupied leks; surface disturbance and other actions that create permanent and high-profile structures such as buildings, storage tanks, and overhead power lines will not be constructed within 0.25 mile of the perimeter of leks, as determined on a case-by-case basis.

Raptors

The potential impacts of the Proposed Action on raptors are: (1) nest abandonment and/or reproductive failure caused by project-related disturbance, (2) increased public access and subsequent human disturbance resulting from new road construction, and (3) small, temporary reductions in prey populations.

The primary potential impact to raptors from project activities is human disturbance during the nesting season (February 1-July 31), which might result in reproductive failure. To reduce this potential, disturbance would not be allowed during the critical nesting season near active raptor nests. Seasonal timing restrictions within a “buffer zone” around nests to avoid disturbance to nesting raptors should reduce impact from construction activities. The BLM would require the relocation of well pad facilities if they are located within 1,200 feet of a ferruginous hawk nest and within 825 feet of any other hawk species nest. Based upon BLM data, 19 raptor nests (five ferruginous hawk, four red-tailed hawk, one artificial ferruginous hawk, one Swainson’s hawk, and eight unknown nests) were documented within the analysis area. Raptors may nest in currently unoccupied areas in the future and if active nests are located on the project area in

future years, appropriate avoidance and mitigation measures would be taken to avoid impacts to breeding raptors.

Fish

No impacts to fish resources are anticipated in the BCII PA due to the lack of any perennial streams.

4.8.1.1 Threatened, Endangered, and Proposed Wildlife and Fish Species

Wildlife Species

In Wyoming, white-tailed prairie dog colonies provide essential habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food, and they depend upon prairie dog burrows for shelter, parturition, and raising young (Hillman and Clark 1980). Two prairie dog colonies have been mapped within the BCII PA. One colony, totaling 24.9 acres, is located in the eastern portion of the BCII PA and is located in a block-cleared zone; therefore, black-footed ferret surveys are not necessary. The other colony, totaling 43.6 acres, was mapped in the northern portion of the BCII PA and it is not in a block-cleared zone. According to USFWS guidelines (2004), prairie dog complexes greater than 200 acres in size that contain colonies within 4.3 miles of each other represent potential habitat for black-footed ferrets.

The RFO attempts to move all surface disturbing activities outside of prairie dog towns, since prairie dogs are on the Wyoming BLM State Sensitive Species List. White-tailed prairie dog towns located within the BCII PA are not expected to be disturbed given the current locations of proposed wells and access roads.

Canada lynx are not expected to occur on the BCII PA because of the lack of suitable habitat; however, there is a slight potential that lynx may migrate through the area. The proposed project is not expected to prevent potential lynx migration through the area.

Bald eagles typically build stick nests in the tops of large coniferous or deciduous trees along streams, rivers, or lakes. This type of habitat is not present in the BCII PA and bald eagles are not known or expected to nest in the BCII PA. Bald eagles may utilize the BCII PA during winter months when big game species are more concentrated on winter ranges. However, the BCII PA does not support concentrated use by bald eagles and their use of the project area is likely incidental. Bald eagles may feed on road-killed carrion in the general vicinity of the BCII PA and workers should be educated about the danger of striking a bald eagle with a vehicle along the main highways and roads providing access to the BCII PA. The Proposed Action is not expected to impact bald eagles, provided that the avoidance and mitigation measures in this document and the RMP are implemented.

4.8.1.2 Sensitive Wildlife and Fish Species

Wildlife Species

Of the sensitive species listed by the WYNDD and BLM for the RFO area (USDI-BLM 2002), the species that are known or suspected to occur in the BCII PA are the white-tailed prairie dog, northern plateau lizard, sage sparrow, Brewer's sparrow, sage thrasher, burrowing owl, short-eared owl, loggerhead shrike, golden eagle, Columbian sharp-tailed grouse, mountain plover, ferruginous hawk, and the greater sage-grouse.

Burrowing owls are typically associated with prairie dog burrows. Burrowing owls may utilize the prairie dog towns in the BCII PA; however, no disturbance is proposed to occur in the prairie dog towns. Therefore, the proposed development is not expected to impact burrowing owls or white-tailed prairie dogs. The sage sparrow, Brewer's sparrow, sage thrasher, and loggerhead shrike are all associated with shrub-dominated habitats (primarily sagebrush and greasewood in the BCII PA). Minimizing disturbance of these habitats would decrease any potential impacts to these species. However, human activity may temporarily displace these species from areas near project facilities.

Although mountain plover habitat does not occur in the BCII PA, some areas of potential mountain plover habitat do occur. The proposed AR Federal Well 12-12, and its associated facilities, will impact 0.49 acre of this habitat. Of this, 0.05 acre will be impacted by the pad site, 0.39 acre will be impacted by the gas line, and 0.05 acre will be impacted by the utility line. No mountain plovers were observed in the potential habitat areas during surveys conducted in 2001, 2002, and 2003. Impacts to mountain plovers would be avoided by adhering to the requirements outlined in Chapter 2, including not allowing construction activities in potential plover nesting habitat during the nesting period from April 10 to July 10. The exact location of mountain plover nests may change annually; however, mountain plovers usually return to the same general area year-to-year and, therefore, mountain plover nest activity status and locations should be kept current. For this reason, it is recommended that surveys for mountain plovers be conducted within areas of potential habitat should development occur between April 10 and July 10 of any year. Due to the size of the proposed impacts, existing disturbances, and management practices outlined in Chapter 2, no adverse impacts to mountain plover are anticipated.

The long-eared myotis, fringed myotis, Townsend's big-eared bat, Wyoming pocket gopher, black-footed ferret, Hoary bat, ringtail, silver-haired bat, western small-footed myotis, Wyoming ground squirrel, and swift fox are mammals listed on the WYNDD and RFO Sensitive Species List. The white-faced ibis, trumpeter swan, northern goshawk, peregrine falcon, long-billed curlew, yellow-billed cuckoo, American avocet, ash-throated flycatcher, black-throated gray warbler, canyon wren, juniper titmouse, merlin, sandhill crane, Scott's oriole, snowy plover, western scrub-jay, chestnut – collared longspur, short – eared owl and Baird's sparrow are WYNDD and BLM-listed sensitive birds. The northern leopard frog, northern many-lined skink, tiger salamander, great basin spadefoot toad, and boreal toad are WYNDD and BLM-listed sensitive amphibians and reptiles. It is unlikely for any of these species to occur in the BCII PA due to the lack of suitable habitat.

Fish Species

No sensitive fish species are known to occur within the BCII PA. The roundtail chub, bluehead sucker, flannelmouth sucker, and Colorado River cutthroat trout are WYNDD and BLM-listed sensitive fish species. There is no desirable habitat for these species within the BCII PA; therefore, no impacts are expected to occur.

4.8.2 No-Action Alternative

Under the No-Action Alternative, the coordinated POD described under the Proposed Action would not be approved. Therefore, no additional effects on wildlife and fish resources would be expected to occur if the proposed wells are not drilled.

4.9 RECREATION

4.9.1 Proposed Action

Impacts to hunting, the primary recreation activity in the BCII PA, would occur as a result of the Proposed Action. The development would result in the removal of wildlife habitat due to the construction of well pads and associated roads. Additionally, disturbance from human activity and traffic would lower the use of habitat by wildlife and cause wildlife to disperse to adjacent undisturbed habitat. Decreased wildlife use of the BCII PA would result in less visitation by local and nonresident hunters.

The extent of wildlife displacement is difficult to predict, as the BCII PA has been used for energy development activities for many years. Ongoing energy development has allowed resident deer and antelope to become accustomed to the noise and human activity in and near the BCII PA. However, the displacement of some big game is likely over the course of the proposed project but, due to the size of the hunt area, this project alone is not likely to reduce herd sizes to a point where WGFD would reduce the number of licenses offered in the hunt area.

Undisturbed landscapes, isolation, and solitude are usually important to non-consumptive users such as photographers, pleasure drivers, and wildlife viewers. Development of the BCII PA would potentially affect the recreation setting due to visual impacts and increased traffic on roads. Changes in the visual setting would be noticed by hunters and other recreational users. This visual degradation would diminish the quality of the recreational experience for most visitors to the BCII PA. Other detractions to the recreational experience would be industrial traffic; noise from traffic, construction, and drilling operations; and dust generated by these activities. These impacts would continue to a lesser degree throughout the life of the project.

Overall impacts to recreation resources would be considered moderate due to the short-term nature of drilling and construction activities, concentrated locations of activities, and the small number of recreational users affected. However, most hunters that normally hunt the project area would hunt other areas to avoid the development activity and reduced desirability of the hunting experience due to visual impacts, habitat loss, and the hazards of gunfire in an industrial area.

4.9.2 No-Action Alternative

Under the No-Action Alternative, no disturbance to hunting and other recreation would occur in the BCII PA as a result of the proposed project.

4.10 VISUAL RESOURCES

4.10.1 Proposed Action

The BLM VRM classification for the BCII PA is Class III. The visual resource management objective for the BCII PA is to allow a moderate level of contrast between project features and the existing landscape. In this management system, the severity of impacts is related to the scenic quality, sensitivity level, and distance zone of the affected environment. In general, short-term impacts would be most severe where the level of contrast is high and highly visible to a potentially large numbers of viewers. The short-term impacts of drilling and field development would exceed the level of contrast permitted in Class III areas. These impacts would dominate the viewshed as seen from Wild Horse Road (BLM 3309), which is located on a ridgeline and has panoramic views.

Due to terrain and elevation, only a small portion of the BCII PA would be visible from SH 789. Drill rig masts located on western edges of buttes and ridges may be visible from this highway; therefore, short-term visual impacts may occur during this phase of development.

Short-term impacts to visual resources associated with construction and drilling would include contrasts in line, color, and texture. These contrasts are associated with drilling rigs, construction equipment, facilities, roads, bare well pads, trailers, and the general industrial character of drilling. Additional impacts may occur from fugitive dust produced by construction and increased vehicle traffic.

Permanent wells, production facilities, and access roads would remain after drilling is complete. The presence of permanent facilities would create continued visual impacts due to contrast in line, form, color, texture, and overall pattern in the landscape over the long-term. Geometric lines associated with these facilities would contrast with vegetation and topography in the BCII PA. Mitigation measures would reduce these visual impacts, but the development would still dominate the viewshed and therefore exceed VRM Class III management criteria.

4.10.2 No-Action Alternative

Under the No-Action Alternative, no new natural gas development impacts to visual resources would occur in the BCII PA as a result of the proposed project.

4.11 CULTURAL RESOURCES

4.11.1 Proposed Action

Federal law and regulations protect cultural resources on public lands, including archaeological sites and historic properties. Cultural resources in the interim drilling area and adjacent lands may have already been affected by surface-disturbing activities, including ongoing natural gas development, road building, and construction of pipelines.

Existing, proposed, or reasonably foreseeable development could add to the level of impact on cultural resources in the immediate area, unless inventories and protective or mitigation measures specified by BLM are followed.

Cultural resources surveys have been completed in the BCII PA, as required by the Interim Drilling Policy, and two NRHP eligible sites were identified. The historic Cherokee Trail (Trail) crosses the northeastern portion of the BCII PA and is currently recommended as eligible for listing on the National Register of Historic Places. Non-contributing and contributing segments of the Trail were identified within two miles of the proposed project. One prehistoric camp site was identified near to a proposed well location.

Native American religious sites have not been previously identified in the BCII PA and the Class III survey did not identify any of these sites in the BCII PA.

It should be possible to eliminate direct and indirect adverse effects to historic properties from the proposed action through avoidance or mitigation measures (data recovery or recordation) on a case-by-case basis. Adverse effects to contributing segments of the Trail are avoided by a minimum of 0.25-mile buffer zone or by locating facilities outside the visual horizon. Other

mitigation measures initiated to protect cultural resources would be ensuring natural colors are utilized for facilities and roads. The potential for incremental increases in cumulative impacts would be circumvented by avoiding known cultural and historical sites in laying out drill sites, access roads, and pipeline corridors. Some unintentional damage to subsurface resources could occur during grading or excavation. However, implementation of resource protection and mitigation measures similar to the techniques described in Chapter 2 would protect these resources when they are discovered.

4.11.2 No-Action Alternative

Under the No-Action Alternative, no cultural resources sites would be disturbed by new natural gas development in the BCII PA.

4.12 SOCIOECONOMICS

4.12.1 Proposed Action

Socioeconomic impacts of the Proposed Action would be largely positive. The project would enhance regional economic conditions and generate revenues from local, State, and Federal government taxes and royalties. Most of the workforce would originate from personnel located in southwestern Wyoming. The relatively small, short-term field development workforce would not create a local boom or increased demand for temporary housing or local government services.

Development and operation of the project would require goods and services from a variety of local and regional contractors and vendors. Expenditures by the Proponents for these goods and services, coupled with employee and contractor spending, would generate economic effects in Carbon County and southwest Wyoming. It is reasonable to assume that the direct and indirect economic benefits of the proposed project would be positive.

4.12.1.1 Oil and Gas Activity in Carbon County

In 2004, 151 APDs were issued for natural gas wells in Carbon County. The 12 new proposed wells associated with this project would be approximately 11% of the 2004 APD level for the County; therefore, this project would not result in a large increase in natural gas wells in Carbon County. However, if successful, this project may increase the likelihood for the ARPA to be developed.

4.12.1.2 Population Effects

The proposed project would not result in a noticeable population increase in Carbon County. Most of the skills and services required for the project are available in the local labor pool, although the recent increase in oil and gas drilling in southwest Wyoming has absorbed much of the available workforce. The proposed project would require 16 to 36 drilling and field development workers for a period of two to three months; many of these workers would be from southwestern Wyoming.

Based on the relatively small workforce and short-term nature of the drilling and field development phase of the proposed project, area housing and businesses could accommodate the increase in activity resulting from the development of the proposed project.

4.12.1.3 Temporary Demand for Housing

Existing housing in Rawlins and nearby communities could accommodate the relatively small demand for temporary housing during drilling and field development associated with the Proposed Action.

4.12.1.4 Law Enforcement and Emergency Response

The relatively small level of field development and operations personnel would be accommodated by existing law enforcement and emergency management resources.

4.12.1.5 Fiscal Effects

The Federal government receives a 12.5% royalty on the fair market value of natural gas produced from Federal leases. Half of these royalties would be returned to the State of Wyoming, which collects a 6% severance tax on gas production, exempting Federal royalties, production, and transportation costs. The State also collects a 4% sales tax on goods and 28% of these funds are returned to the local county. These natural gas revenues represent a substantial funding source for the State of Wyoming and Carbon County.

If the productive life of each successful gas well in the project is 15 years and produces, on average, nearly 100,000 cubic feet of natural gas per year, which is then sold (on average) for \$2.50 per thousand cubic feet, the sales value of each well would be approximately \$3.5 million over the life of the project. If 10 Federal gas wells within the project were productive, the Federal royalties would be approximately \$6 million and the severance tax collected by the State of Wyoming would be approximately \$2 million. These numbers are approximate, and are only intended to indicate the order of magnitude of possible fiscal effects.

4.12.2 No-Action Alternative

Under the No-Action Alternative, no Federal mineral royalties would be gathered and no additional socioeconomic effects would be expected to occur if the BCII PA wells are not drilled.

4.13 TRANSPORTATION

4.13.1 Proposed Action

4.13.1.1 Federal and State Highways

The Proposed Action would cause small increases in traffic volumes, which would result from movement of project-related workers, equipment, and materials to and from the BCII PA for drilling, field development, well service, field operations, and reclamation.

Chapter 2 discussed the average number of trips associated with various field activities. It was determined that drill rigs, water trucks, and other heavy equipment would be transported to the BCII PA and remain there until drilling is complete. Materials and supplies would be delivered to the BCII PA on a weekly basis and stored at a staging area. All personnel would commute daily to the project site with the exception of drilling engineers, who would stay within the BCII PA near the drill site during the work week. Based on this plan, the Proposed Action would generate 15 to 20 round trips per day over the course of the drilling and field development period. After drilling and field development is complete, project-related traffic would average one or two trips per day. Slightly higher peak periods would occur when maintenance activities

are performed on wells and facilities. Based on these estimates, the increase in area traffic associated with the Proposed Action would not affect the level of service for IH 80 or SH 789 (Rounds 2000).

Based on the relatively small traffic increases and short duration in traffic volume, it is unlikely that the Proposed Action would result in a measurable increase in accident rates on Federal and State highways. During the operations phase, the probability of an increase in accident rates that could be attributed to the project would be negligible.

4.13.1.2 County Roads

A slight increase in traffic on the roads that provide access to the BCII PA may occur. The relatively small, short-term increases in traffic are unlikely to result in substantial deterioration of the roads or substantial increases in accidents. The primary effects of increased project-related traffic on County and BLM roads would be accelerated requirements for maintenance.

Increased traffic may raise the potential for accidents between vehicles and livestock. The potential for these accidents increases during calving and periods when cattle are moving to new ranges. To reduce the likelihood of this occurring, the Proponents should coordinate their development efforts with ranchers to prevent these accidents.

4.13.1.3 Internal Roads

The BCII PA transportation measures proposed by the Proponents are described in Section 2.1.2.1. Based on the proposals, an estimated 5.2 miles of new roads would be constructed within the project area. The construction of these roads would cause no fiscal impacts for the BLM because the project Proponents are responsible for the construction and maintenance of these roads.

4.13.2 No-Action Alternative

Under the No-Action Alternative, no additional roads would be constructed to access natural gas facilities. Additionally, traffic levels would remain at existing levels in the BCII PA.

4.14 HEALTH AND SAFETY

4.14.1 Proposed Action

There is a relatively low risk to project workers from industrial accidents, firearm accidents, and natural disasters. There would be a slight increase in risk for the general public from traffic accidents and range fires during drilling and field development. Only a small increase in these risks would occur during field operations.

4.14.1.1 Occupational Hazards

Two types of workers would be employed at the BCII PA: oil and gas workers and special trade contractors. Oil and gas workers had an annual accident rate of 4.0 accidents per 100 workers in 1998 and special trade contractors had a non-fatal accident rate of 8.9 accidents per 100 workers in 1998 (U.S Department of Labor 2002). These rates are comparable to the overall private industry average for all occupations of 6.2 accidents per 100 workers.

Recently, there has been concern among CBM workers that training and safety standards used for conventional oil and gas activities may not be appropriate for the CBM industry (Rock Springs Rocket Miner 2001). The Wyoming Occupational Health and Safety Administration, Worker's Safety Division is collaborating with energy company officials to consider revising worker safety standards and training requirements.

The probability of injuries during the drilling and field development phase of the project is low. Based on the small number of employees, the annual statistical probability of injuries during field operations is low.

The BLM, OSHA, United States Department of Transportation (USDOT), and the WOGCC each regulate certain safety aspects of oil and gas development. Provided the Proponents adhere to safety regulations and the various agencies enforce the regulations, the probability of accident or injury would be reduced.

4.14.1.2 Other Risks and Hazards

Risks to public health and safety are not expected to increase as a result of the proposed project. Impacts associated with sanitation or the materials used in CBNG development would be prevented or reduced by implementing the mitigation measures described in Chapter 2.

The risk of fire in the BCII PA could increase as a result of the proposed project, but would remain low. Fire is an inherent risk associated with construction; industrial development; and the presence of fuels, storage tanks, natural gas pipelines, and gas production equipment. This small risk would be reduced because facilities would be situated on pads and in locations that are graded and devoid of vegetation. The risk is further reduced by the presence of fire suppression equipment, a no smoking policy, shutdown devices, and other safety measures typically incorporated into gas production. In the event of a fire, property damage most likely would be limited to construction- or production-related equipment and rangeland resources.

4.14.2 No-Action Alternative

Under the No-Action Alternative, no new natural gas development would occur in the BCII PA, resulting in no increase in safety issues in the area.

4.15 HAZARDOUS MATERIALS

4.15.1 Proposed Action

All project-related activities involving hazardous materials would be conducted in a manner that reduces potential environmental impacts. Potential impacts associated with hazardous materials include human contact, inhalation or ingestion, and the effects of exposure, spills or accidental fires on soils, surface and groundwater resources, and wildlife. No hazardous material, as defined by CERCLA, would be used in the construction or drilling operations associated with the proposed wells and no RCRA hazardous wastes would be generated by well-drilling operations.

The mitigation measures described in Chapter 2 would reduce the risk of spills and accidental fires, and provide protocols and employee training to deal with these events should they occur. Based on successful implementation of these plans and procedures, no impacts associated with hazardous materials are anticipated. Any spills of oil, gas, or any potential hazardous substance

would be reported immediately to the BLM, landowner, local authorities, and other responsible parties and would be mitigated immediately, as appropriate, through cleanup or removal to an approved disposal site.

4.15.2 No-Action Alternative

Under the No-Action Alternative, no new natural gas wells would be drilled and no issues related to hazardous materials would be encountered in the BCII PA.

4.16 NOISE

4.16.1 Proposed Action

Noise associated with construction and natural gas production operations can cause disturbance that affects human safety (at extreme levels) or comfort and can modify animal behavior. Noise levels that exceed the 55-dBA maximum standard can occur at construction and production operations. Under typical conditions, excess noise levels decline below 55 dBA at 3,500 feet from the source (BLM 1991). Noise levels at 600 feet from the compressor site, contained in an enclosed building, are estimated to be below 55 dBA (BLM 1999b). Construction-related impacts would be short-term, only lasting during construction of well sites, access roads, and other ancillary facilities. Noise would be created over the life of the project at the individual well sites as a result of production facilities.

Due to the low human population density in the BCII PA, noise generating activities associated with the Proposed Action would be a sufficient distance from any homes. Overall noise produced by construction and support services equipment during peak activity periods would be moderate because of the dispersed and short-term nature of these activities. However, some noise disturbance to livestock and wildlife may result from the proposed project.

4.16.2 No-Action Alternative

Under the No-Action Alternative, no noise impacts from new natural gas development would occur in the BCII PA.

4.17 CUMULATIVE IMPACTS

This section describes cumulative impacts related to the Proposed Action under consideration in this EA. The CEQ regulations for implementing NEPA define cumulative impacts as:

“The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions and regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7).

The CEQ guidance limits cumulative impact analysis to “important issues of national, regional, or local significance” (CEQ 1997). Therefore, this section addresses cumulative impacts in an area of influence (AOI). Depending on the resource, the AOI could be the BCII PA or it may have a larger geographic boundary, such as for air quality (expanded regional boundaries).

Past, Existing, and Reasonably Foreseeable Future Activity

Past or existing actions on or in the vicinity of the BCII PA that contribute to cumulative impacts include oil and gas exploration, ranching, and dispersed recreation. Reasonably foreseeable future activities planned for the ARPA include expanded natural gas exploration in the form of 2,000 additional wells. While other additional natural gas exploration may occur, it has not been proposed and is therefore not considered in this analysis.

4.17.1 Cumulative Impacts by Resource

4.17.1.1 Geology, Minerals, and Paleontology

The AOI for geology, minerals, and paleontology would be the ARPA. Existing and reasonably foreseeable actions would not contribute significantly to impacts to geology and mineral resources. Future extraction of natural gas will be increased under proposals being considered for the ARPA. This future extraction will result in depletion of natural gas reserves which is a goal of the BLM and is not considered an adverse impact.

Increased natural gas development may result in the loss of significant fossil resources. Undocumented fossils exist throughout the ARPA, many of which could be scientifically significant. Therefore, potential exponential increases in natural gas development may result in the loss of significant fossils of scientific importance.

4.17.1.2 Air Quality

The AOI for air quality would encompass the ARPA and could extend to Class I or II wilderness areas located within 100 miles of the proposed project. Cumulative impacts from emissions could affect an area well beyond the borders of the ARPA.

Existing and reasonably foreseeable future actions in the ARPA would impact air quality through increased emissions associated with vehicles, machinery, and compressors. The proposed addition of 2,000 natural gas wells and associated facilities in the ARPA would add increased emissions to the regional air emissions. Cumulative impacts were analyzed for these proposed wells during the Atlantic Rim EIS process. This analysis determined that in-field cumulative impacts resulting from project and regional emission sources were below the applicable ambient air quality standards. Additionally, the analysis also determined that far-field cumulative impacts for ambient background pollutants, visibility, and atmospheric deposition were below applicable regulatory standards.

4.17.1.3 Soils

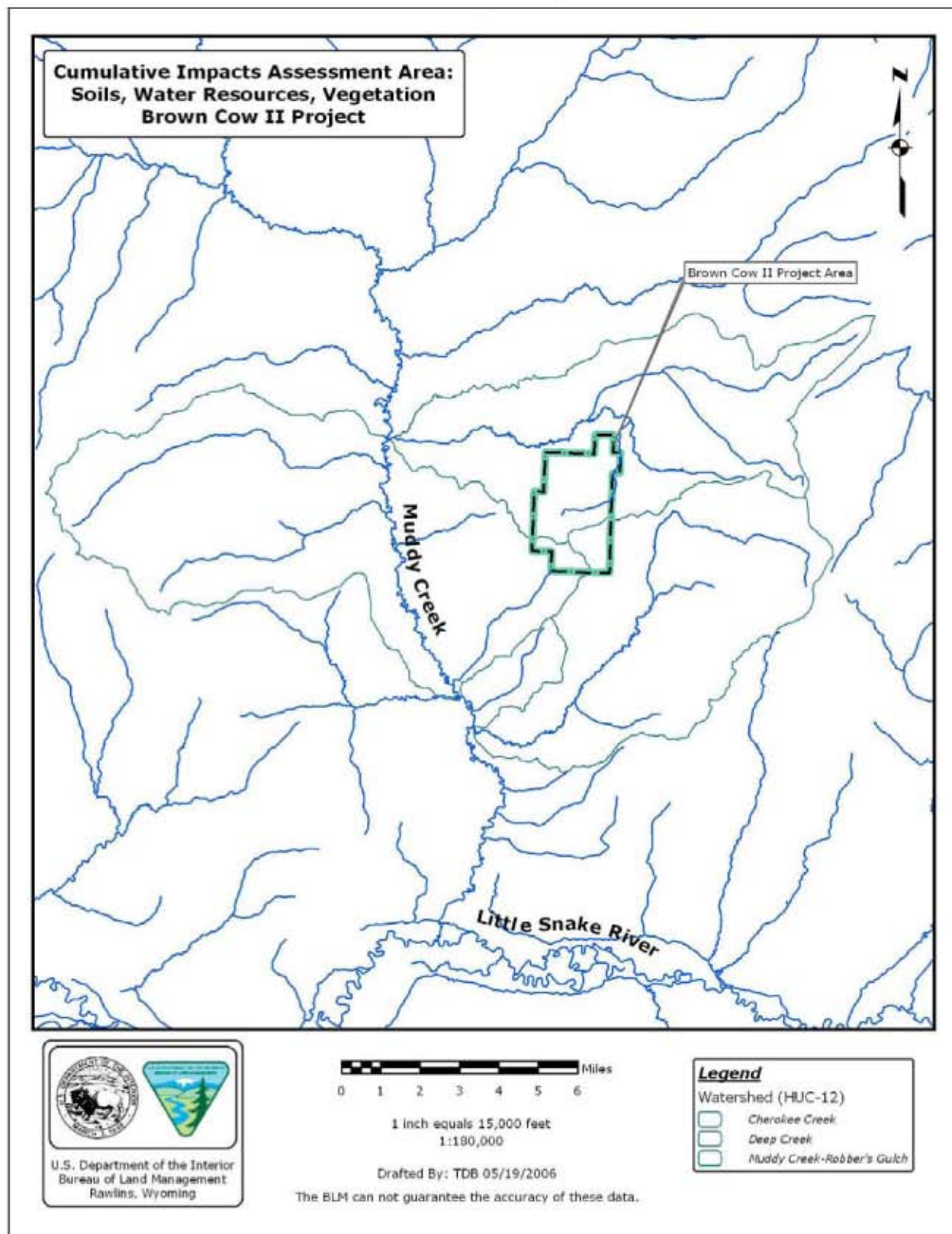
The AOI for soils includes the HUC-12 watersheds inclusive of the BCII PA. Cumulative impacts include effects on soil from existing and planned exploration and development, plus reasonably foreseeable development in the BCII PA. Small impacts to soils can be expected from these actions if all site-specific mitigation and reclamation procedures are followed. Most of the disturbance to soils would be short-term and would not contribute to the loss or degradation of this resource in the future. However, reasonably foreseeable development of natural gas reserves adjacent to the BCII PA in the ARPA would result in the potential for increased erosion and sedimentation in watersheds.

The proposed project (i.e. well locations, facilities, proposed access roads, gathering pipelines, and utility lines) is located within three Hydrologic Unit (HU) 12-level watersheds:

<u>HUC-12 Name</u>	<u>Area</u>	<u>HUC-12 ID #</u>
Cherokee Creek	23,790 acres	140500040305
Muddy Creek – Robber’s Gulch	35,706 acres	140500040306
Deep Creek	22,874 acres	140500040309

These watersheds (see **Figure 4-1**) are located within the Muddy Creek hydrologic basin, tributary to the Little Snake River hydrologic basin, tributary to the Colorado River hydrologic basin, with eventual tributary contribution to the Pacific Ocean. The three HUC 12-level watersheds comprise a total of 82,370 acres. These watersheds serve as discrete planning units of a manageable scale for the assessment of cumulative impacts associated with soil, wetland, and vegetation resources. Thus, this 82,370-acre area is considered the cumulative impacts assessment area (CIAA) for these resources.

**Figure 4-1
Watershed Map**



As of February 2006, there are 72 wells producing, shut-in, or in the process of being drilled within the CIAA (see **Figure 4-2**) in which the project is located. There are nine additional approved APDs on file at the WOGCC. The Proposed Action includes the drilling of 12 additional well locations. In total, there are 93 existing and reasonably foreseeable APDs in the watershed (81 non-project wells).

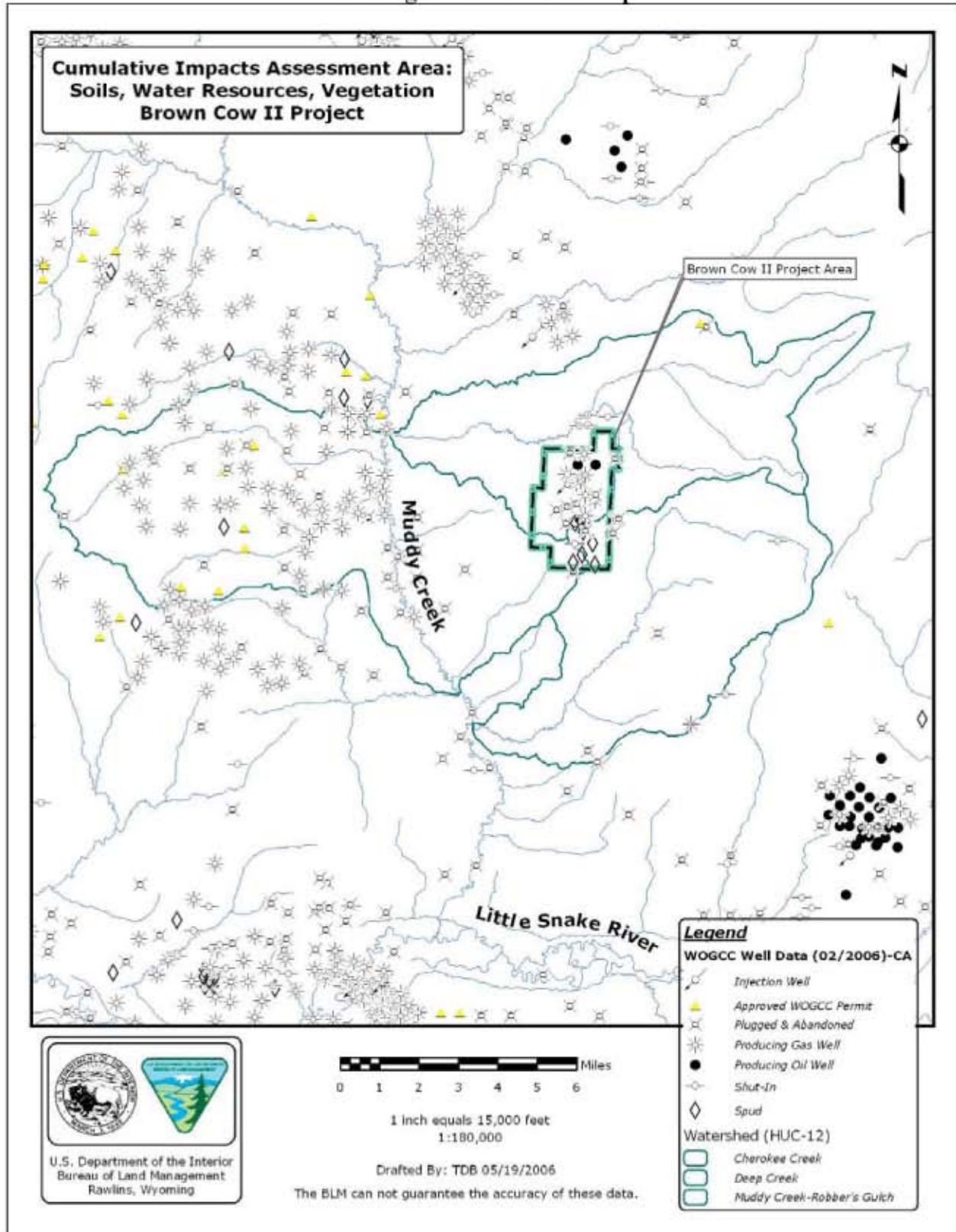
In development of the Desolation Flats EIS, a natural gas project within south-central Wyoming, an analysis of the expected short-term disturbance area for typical oil and gas wells within the exploratory development area provided an estimate of 12.0 acres per well (including well pad, access road, and pipeline) for most wells. It should be noted that the short-term disturbance acreage represents the disturbance associated with a typical well prior to any reclamation activities. Many of the producing wells have been reclaimed to their production facilities.

Other known activities within the CIAA include conventional (deep-gas activity, particularly west of Muddy Creek) and CBNG exploration and development, rangeland management, and outdoor recreation. Several existing roadways are present within the area.

Using an assumption of 12.0 acres of disturbance per well location, the Proposed Action (144 acres), in combination with the 81 existing and reasonably foreseeable non-project wells (972 acres), would result in a total cumulative oil and gas development disturbance (short-term) of 1,116 acres within the watersheds. It is assumed that pipeline disturbances are successfully reclaimed, or soon will be, and existing ancillary facilities are not included due to a lack of knowledge about extant disturbance associated with these features in the CIAA. The total anticipated surface disturbance reasonably foreseeable, and in combination with the Proposed Action, equals approximately 1.4% of the CIAA.

This proposed project, in combination with other reasonably foreseeable activities and actions within the CIAA, is not expected to cumulatively affect resources of consideration if the mitigation measures provided in Chapter 2 as well as BMPs are implemented.

**Figure 4-2
Existing Well Locations Map**



4.17.1.4 Water Resources

The AOI for water resources is the HUC-12 watershed. Past, present, and reasonably foreseeable land use activities include ranching, oil and gas exploration, and recreational use. Increased future natural gas development in the HUC-12 watershed would contribute to surface water degradation in the watershed. Sediment and salt contributions are expected to increase in the Little Snake River from this future development. Mitigation commitments should help decrease some of the sediment and salt loading.

No serious groundwater pollution has been detected in the watershed. Current and future oil and gas exploration must comply with State and Federal environmental regulations, thereby decreasing the potential for cumulative water quality and quantity impacts.

4.17.1.5 Vegetation, Wetlands, and Invasive Weeds

The AOI for vegetation (including wetlands and weeds) consists of the HUC-12 area. Cumulative impacts for vegetation in the BCII PA would consist of past, current, and proposed natural gas development, and vegetation management connected with range improvements.

The Proposed Action would result in permanent loss of vegetation in the BCII PA. The total long-term loss of vegetative cover from the proposed project is 20.8 acres. A large percentage of this vegetation consists of mountain big sagebrush and Wyoming big sagebrush cover types. These vegetation types are abundant in the project area and throughout south-central Wyoming. Therefore, reductions in these vegetative communities would not be considered a significant impact. Proper reclamation of these native plant communities would ensure that cumulative loss would not occur from increased future natural gas exploration.

The potential for weed infestation exists from current and proposed energy development. Increased soil disturbance from future natural gas development would contribute cumulatively to the BCII PA invasive weed problem. However, following the BLM mitigation requirements for weed infestation would reduce this threat. Overall, only small cumulative impacts to vegetation are expected from this project.

4.17.1.6 Range Resources and Other Land Uses

The AOI for range resources is the 73,966-acre CGA. Cumulative impacts resulting from the Proposed Action would consist of the loss of 20.8 acres, or approximately 0.03% of the CGA. This reduction would not impact the CGA within the range of natural variability. Additionally, the reseeding of disturbed sites would convert sagebrush habitat to native grass habitat, which would be a short-term beneficial range resource impact resulting from the Proposed Action.

4.17.1.7 Wildlife and Fisheries

The AOI for wildlife resources is determined by the ranges of wildlife species and BLM stipulations protecting species from project-related impacts. Big game species have an AOI based on the WGFD herd units. Greater sage-grouse leks have an AOI of a two-mile buffer around the BCII PA. Raptor nests would have an AOI that includes a one-mile buffer around the BCII PA. Other smaller wildlife species would have an AOI of only the BCII PA.

The short-term direct impacts to wildlife would include disruption of wildlife during development and future expansion of CBNG operations. This disruption would include displacement of wildlife, loss of habitat, and greater vehicle access to the BCII PA. Mitigation measures would allow for a quick recovery of the habitat for the displaced wildlife.

Cumulative impacts from the current and proposed development in the BCII PA have the potential to impact big game (e.g. antelope, deer, and elk) in the long-term. Direct impacts to big game would be the combination of the loss of habitat that would be converted to CBNG facilities and human disturbance (e.g. noise, vehicles, and dust). Indirect impacts associated with the project include increased stress due to human/wildlife encounters, potential reductions in birth or survival rates, and fragmentation of migration corridors.

Cumulative impacts to the greater sage-grouse would result from the present and future energy development in BCII PA. The direct impacts associated with construction of the proposed project would be temporary. Increased vehicle traffic, noise, dust, and range improvement projects in the BCII PA and adjacent lands would cause a disruption of normal behavior. The indirect impacts in the BCII PA to the greater sage-grouse could disrupt lek activity, displace nesting birds, and reduce critical wintering habitat.

The cumulative impacts to raptors resulting from existing and proposed energy development are unknown at this time. BLM studies for the ARPA have determined that additional studies are needed to determine energy development impacts to raptors (BLM 2005).

Several BLM sensitive species may occur within the BCII PA. Cumulative impacts to these species should be reduced by the small scale of the proposed project, as only 20.8 acres of permanent disturbance would occur as a result of the proposed project. However, future development may result in additional permanent loss of habitat that could impact certain sagebrush dependent species.

Cumulative impacts to mountain plovers have the potential to occur. While impacts to mountain plover habitat due to the BCII development are less than 0.5 acre, disturbances to the habitat currently exist. Continued development within the habitat may reduce the availability and quality of mountain plover habitat in the BCII PA and adjacent areas in the future.

4.17.1.8 Recreation

The AOI for recreational resources would include the BCII PA and a two-mile buffer around the area. This buffer is considered because of the hunting activity and the potential displacement of this user group from this area.

Overall, cumulative impacts to recreational use in the BCII PA would consist primarily of the displacement of hunters. This would occur throughout the life of this project. The increased road density, traffic, noise, and degradation of scenery would result in hunters moving to other locations to hunt. Other recreational use, such as automobile tours and wildlife viewers, would also relocate and use other areas. Displacement of hunters from the BCII PA may take place for more than 20 years (the estimated life of the project is 20 years).

4.17.1.9 Visual Resources

The AOI for visual resources would be areas in the visual range of the BCII PA. This can vary, and may include areas up to several miles from the proposed project because key observation points occur along the ridgeline that Wild Horse Road (BLM 3309) follows.

Existing visual qualities in the area have already been affected by natural gas development, including road construction and well development. Proposed and reasonably foreseeable development would add to visual impacts in the BCII PA. Increases in energy development would result in decreases in the visual quality of the landscape. This degradation of the visual resource would result in the area becoming less attractive to visitors and recreational users.

The mitigation measures described in Chapter 2 would reduce the visual impact of oil and gas development in this area, but visual impacts would still be high because they would dominate the viewshed as seen from primary roads within the BCII PA.

4.17.1.10 Cultural Resources

The AOI for cultural resources is the BCII PA. Proposed and future energy development has the potential to cumulatively impact the viewsheds of the Cherokee Trail. The BLM is currently working on a policy to mitigate the cumulative effect of energy development on historic trails such as the Cherokee Trail. Current mitigation procedures include a 0.25-mile buffer on each side of a historic trail.

4.17.1.11 Socioeconomics

The AOI for socioeconomics is Carbon County, and includes the communities of Rawlins and Baggs. Increased natural gas development in Carbon County would increase the cumulative impacts to housing and social services in the County. However, the small scale of the proposed project should not stress the County's housing and services. The proposed project would be completed before the ARPA is fully developed after issuance of the Atlantic Rim EIS Record of Decision. Additionally, the staff working on the Doty Mountain and Red Rim projects would likely work on this project. This means the proposed project would not require that new workers be brought into the area to complete the project. Approximately 16 to 36 full-time workers would be employed during the construction and drilling phase of the project.

The displacement of hunters, particularly those guided by outfitters, could cumulatively impact the Carbon County economy. Hunting revenue represents a large portion of the economy during the fall. If hunters and outfitters are displaced from BCII PA, they could relocate to another part of the ARPA not affected by natural gas activity. However, future proposed energy development in the ARPA may cause a greater loss of hunting opportunity that would adversely impact the local economy.

Overall, the current natural gas activity represents an important source of government revenue, employment, and retail sales. This is a beneficial cumulative impact of increasing natural gas development in Carbon County.

4.17.1.12 Transportation

The AOI for transportation is the IH 80 corridor in Carbon County and access roads to the BCII PA. CBNG development in the BCII PA may result in small traffic increases on IH 80 and access roads. However, these roads would be able to handle the increased traffic and no change to the level of service would occur. Even with increased future traffic volumes, the Wyoming Department of Transportation estimates that 2012 traffic at the IH 80 and Creston Junction access would increase less than 1% from current volumes (BLM 2005).

4.17.1.13 Health and Safety

The AOI for health and safety is the BCII PA. A potential exists for increased risks to workers and the public resulting from natural gas development activities and increased traffic. This increased risk would primarily occur during the construction and drilling phase of the project, when most of the activity would occur in the BCII PA. These impacts would be short-term and small. No additional cumulative impacts are expected from proposed energy development.

4.17.1.14 Hazardous Materials

The AOI for hazardous materials is the BCII PA. Cumulative impacts for hazardous materials would result from potential contamination of the area resulting from present and future energy development. This impact is reduced through adherence to BLM guidelines for the storage and handling of hazardous materials. With strict regulatory guidelines, no cumulative impacts resulting from improper handling of hazardous materials is expected to result from the proposed project.

4.17.1.15 Noise

The AOI for noise would be the BCII PA. Increased noise would result from construction activities and during operations, particularly at the compressor site. This introduction of noise from present and future energy activity has the potential in the short-term to displace wildlife, particularly greater sage-grouse and big game. In the long-term, if anthropogenic sources of noise do not exceed 10 dBA above natural ambient or background noises measured at an occupied lek, then sage-grouse may become acclimated to the noise and return to normal activity in the area. This noise level may be obtained through the use of mufflers or other proven methods to reduce or baffle sound originating from compressors and noise producing facilities.